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COMPLETE SPECIFICATION.

Improvements relating to the Manufacture of Paint.

We, THE BRITISH CECA COMPANY LIMITED, of 175 Piccadilly, London, W.1, a Company incorporated under the laws of Great Britain, MAURICE VICTOR GIRARD, of the Company's address and a citizen of the French Republic, POSTANS LIMITED, of Trevor Street, Birmingham 7, a Company incorporated under the laws of Great Britain, and MICHAEL HENRY MILLER ARNOLD, of the latter Company's address and a British Subject, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manufacture of paint.

It is known that there is an optimum size for the particles of paint pigments, this optimum size being of the order of one micron effective means diameter, but varying with the particular colour or pigment; in practice, this optimum size is achieved by only a relatively small proportion of the particles. It is also known that in the separation of particles from a gaseous suspension by means of cyclone separators and like apparatus, it is not economical as a general rule to attempt to separate out particles of a size less than about ten microns effective means diameter, depending upon the density and shape of the particle and also upon the type of separator employed; consequently, most of the particles of a finely divided pigment which can be removed and collected from a gaseous suspension by means of a cyclone separator will be much larger than the optimum size for paint manufacture, although the particles passing the cyclone separator will be of the right order of size for pigmentary purposes, including a proportion (for example, 10%) which are of optimum size.

The present invention is based upon the appreciation that fundamentally the manufacture of paint is a process of wetting the particles of pigment with a body medium or other vehicle, and that if a particle of pigment having the right order of size and suspended in a gas can be wetted with a suitable liquid and thereafter caused to increase in effective mean diameter by aggregation with other like particles, it may be brought to a size such as can be separated out and collected by a cyclone or like apparatus, the wetter aggregates so collected being in proper condition for dispersion in a body medium or other vehicle, which may be the same as the wetting liquid employed.

The invention consists of an improved method of paint manufacture which comprises the steps of suspending a finely divided pigment in a gas current, treating the gaseous suspension so as to remove particles of the pigment exceeding a limit of size suitable for pigmentary purposes, subjecting the suspension containing the remaining particles to an atomized spray or curtain of a wetting liquid miscible with the body medium or vehicle to be employed, causing collision of the wetted particles so that they will cohere as aggregates of increased diameter, treating the suspension containing those aggregates of increased diameter so as to collect the wetted aggregates composed of particles which are of diameter close to the optimum pigmentary size, and mixing these collected aggregates of increased diameter with the body medium or other vehicle for paint manufacture. The fine particles not so collected may be used as such for paint manufacture or returned for retreatment in the suspension so as to form aggregates of increased diameter, of the right order of size for pigmentary purposes.

The gaseous current or suspension is preferably inert as regards the pigment and the wetting liquid, and also preferably circulated in a closed system, the gas being substantially saturated with the wetting liquid; the latter may be the same as the body medium

or vehicle for paint manufacture with which the collected particles are finally mixed.

The apparatus for carrying ut this method may comprise means for producing a current of gas, a pulverizer adapted to disperse the pigment in the gas current to form a gaseous suspension, means for controlling the rate of feed of the pigment to the pulverizer, a separator for removal of oversize particles of pigment from the gaseous suspension, means for projecting an atomized spray of wetting liquid into the path of the gaseous suspension, a venturi device through which the gaseous suspension containing the remaining finer particles of pigment is passed together with the atomized liquid spray, and a second separator for collection of the pigment aggregates of increased size produced by cohesion of the wetted finer particles.

The invention is hereinafter described with reference to the accompanying diagrammatic drawing of apparatus for carrying out the manufacture of paint.

As shown in this drawing, the apparatus comprises a hopper 10 to which the pigment to be employed is fed by gravity, the pigment falling in finely divided form from the bottom of this hopper 10 through an isolating valve 11 into an intermediate hopper 12 from which in turn the pigment falls through another isolating valve 13, provided with an automatic gas seal, into a screw conveyor 14 driven at variable speed by suitable means (not shown). The intermediate hopper 12 is also arranged to receive pigment recovered at a later stage, such pigment falling from a cyclone or gas separator 15 having an isolating valve 16, with the two isolating devices 11 and 16 discharging into the top of the intermediate hopper through pipes 17 and 18 respectively.

The screw conveyor 14 acts to control the rate at which the pigment from the intermediate hopper 12 passes into a pulverizer 19, in which the pigment is dispersed in a current of inert gas, such as carbon dioxide or nitrogen, supplied by a circulating fan or blower 20. The suspension or gas current containing the pigment particles is forced through a pipe 21 into the cyclone or gas separator 15, which operates to separate out all oversize particles, these particles falling to the bottom of the separator and collecting for discharge through the isolating valve 16 for return through the intermediate hopper 12 and conveyor 14 into the pulverizer. These separated particles may be, for example, those exceeding ten microns in effective mean diameter, whereas the finer particles remaining in the gas current will be of the right order of size for pigmentary purposes.

The gaseous suspension containing the finer particles is then caused to flow through a pipe 22 into a wetting device 23 incorporating means for projecting an atomized spray of a suitable wetting liquid supplied by a pipe 24; this liquid medium may conveniently consist of white spirit, xylol or other solvent of the vehicle to be employed, or it may be a drying oil, varnish, lacquer or the like, or a solution or mixture thereof. The atomized liquid spray or curtain is projected coaxially with the gas current, for example by a venturi device fed by an aero-jet generator 25 such as described in Patent Specification 686,779, whereby the fine particles of pigment suspended in the gas current are caused to undergo a violent acceleration as they enter the convergent part of the venturi device together with the high-speed aerosol or very fine mist; the gas employed for atomizing the wetting liquid is preferably the same inert gas (for example carbon dioxide or nitrogen) as that used for the suspension of the pigment particles, this gas being supplied under pressure by a pipe 26. In this way, the fine particles are caused to collide with the atomized droplets of the spray or curtain, so that the solid particles of pigment become effectively wetted by the liquid droplets, these wetted particles then cohering to form aggregates of increased mean diameter.

The wetted aggregates, increased in size but still in suspension in the gas current, are now caused to flow through a second cyclone or separator 27, wherein the aggregates which have increased in diameter to a sufficient extent, for example over 10 microns in diameter, can be separated without difficulty from the gaseous medium in which they have been suspended. The aggregates collected in this separator 27 are mixed with a suitable body medium or other vehicle, which may be the same as that employed for the wetting liquid, or any other solvent or thinner as in the ordinary method of paint manufacture; this addition may be made by spraying in the liquid near the top of the separator 27, as by a spraying device fed by a pipe 28, or by mixing the liquid with the wetted pigment aggregates at the bottom of the separator, for example in a mixing chamber provided with suitable stirring means.

After its passage through the second cyclone or separator 27, the gaseous current may be recirculated by way of a pipe 29 leading back to the fan 20, from which the gas will be returned to the pulverizer 19 for the addition thereto of a fresh quantity of pigment, the current being then forced into the first cyclone 15 for separation of the oversize particles as before. In this way, the fine particles which have not been trapped by the second separator 27 on the first circuit, will have another opportunity of increasing in diameter by aggregation when wetted by the atomized spray or curtain in the wetting device 23, so that on the next circuit the aggregates may be separated out

and collected for mixing with the body medium or other vehicle, the wetted pigment slurry discharged at the bottom of the separator 27 being further diluted if required before use as paint.

Recirculation of the gaseous current also results in a saving of both gas and wetting liquid, the latter economy being explained by the fact that it is desirable to operate with gas which is substantially saturated with the liquid in order to prevent evaporation of the fine droplets from the pigment particles wetted with the liquid.

Where the gas is circulated through a closed system, as in the example illustrated, provision will be made for releasing the gas to the atmosphere when required, as by an outlet 30 controlled by a shut-off valve 31, and also for introducing gas into the system when necessary for make-up purposes, as by a gas inlet 32 controlled by a shut-off valve 33. The gas employed may consist of air, instead of carbon dioxide or nitrogen as mentioned above, but where there is a risk of the wetting liquid becoming oxidized in air, or a possibility of the formation of an explosive mixture, for example in the case of white spirit, it is wiser to use an inert gas.

It is to be noted that the invention is not limited to the use of cyclone separators, as other forms of separators may be employed; for example a wet separator may be used for the recovery of the wetted aggregates, or again an electrostatic precipitator may be used for the separation of dry or wet aggregates from the gaseous current.

It is to be noted also that the term "paint" is to be interpreted as including any kind of pigmentary dispersion in a liquid vehicle, for example enamels or lacquers.

What we claim is:—

1. A method of paint manufacture which comprises the steps of suspending a finely divided pigment in a gas current, treating the suspension so as to remove particles of the pigment exceeding a limit of size suitable for pigmentary purposes, subjecting the gaseous suspension containing the remaining particles to an atomized spray or curtain of a wetting liquid miscible with the body medium or vehicle to be employed, causing collision of the wetted particles so that they will cohere as aggregates of increased diameter, treating the suspension containing those aggregates of increased diameter so as to collect the wetted aggregates composed of particles which are of diameter close to the optimum pigmentary size, and mixing these collected aggregates of increased diameter with the body medium or other vehicle for paint manufacture.

2. A method of paint manufacture according to Claim 1, in which fine particles contained in the treated suspension but not collected therefrom are returned for retreatment in the suspension so as to form aggregates of increased diameter, of the right order of size for pigmentary purposes.

3. A method of paint manufacture according to Claim 1, in which the gas current or suspension is inert as regards the pigment and the wetting liquid.

4. A method of paint manufacture according to Claim 1, in which the gas current or suspension is circulated in a closed system, the gas being substantially saturated with the wetting liquid.

5. A method of paint manufacture according to Claim 1, 2, 3 or 4, in which the treatment of the gaseous suspension so as to remove or to collect the aggregates therefrom, is effected by subjecting the suspension to centrifugal, electrostatic or wet separation.

6. Apparatus for carrying out the method of Claim 5, comprising means for producing a current of gas, a pulverizer adapted to disperse the pigment in the gas current to form a gaseous suspension, means for controlling the rate of feed of the pigment to the pulverizer, a separator for removal of oversize particles of pigment from the gaseous suspension, means for projecting an atomized spray of wetting liquid into the path of the gaseous suspension, a venturi device through which the gaseous suspension containing the remaining finer particles of pigment is passed together with the atomized liquid spray, and a second separator for collection of the pigment aggregates of increased size produced by cohesion of the wetted finer particles.

7. Apparatus according to Claim 6, comprising also means for collecting the oversize particles removed from the gaseous suspension and returning them to the pulverizer.

8. Apparatus according to Claim 6, comprising means for causing the gas current to circulate in a closed system through the pulverizer, separators, spray - projecting means and venturi device, with means for releasing or removing gas from the system when required and for introducing gas into the system when necessary for make-up purposes.

9. A method of paint manufacture, substantially as described.

10. Apparatus for the manufacture of paint, substantially as described, with reference to and as illustrated in the accompanying diagrammatic drawing.

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PROVISIONAL SPECIFICATION.

Improvements relating to the Manufacture of Paint.

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This invention relates to the manufacture of paint.

It is known that there is an optimum size for the particles of paint pigments, this optimum size being of the order of one micron effective mean diameter, but varying with the particular colour or pigment. It is also known that in the separation of particles from a gaseous dispersion by means of cyclone separators and like apparatus, it is not economical as a general rule to attempt to separate out particles of a size less than about ten microns effective mean diameter, depending upon the density and shape of the particle and also upon the type of separator employed; consequently most of the particles which can be removed and collected from a gaseous dispersion by means of a cyclone separator will be larger than the optimum size of pigment particle for paint manufacture.

The present invention is based upon the appreciation that fundamentally the manufacture of paint is a process of wetting the particles of pigment with a body medium or other vehicle, and that if a suspended particle of pigment having the optimum size can be wetted with a suitable liquid and thereafter caused to increase in effective mean diameter to a size such as can be separated out by a cyclone or like apparatus, the wetted particles so collected will be already agglomerated with the liquid and in proper condition for suspension in a body medium or other vehicle, which may be the same as the wetting liquid employed.

The invention consists of an improved method of paint manufacture which comprises the steps of dispersing a finely divided pigment in a gaseous current, passing the dispersion into a separator so as to remove particles of the pigment exceeding a desired limit of size, subjecting the dispersion containing the remaining particles to an atomized spray or curtain of a wetting liquid, causing collision of the wetted particles so that they will combine or cohere together as particles of increased effective mean diameter, treating the dispersion containing these particles of increased diameter in a second separator so as to collect the wetted particles which have attained an appropriate diameter, and mixing these collected particles of increased diameter with a body medium or other vehicle for paint manufacture.

According to a preferred embodiment of the invention, the pigment to be employed for a paint is fed from a hopper through a dosing device and dispersed, for example by a centrifugal pulverizer, in a current of gas such as carbon dioxide or nitrogen. A centrifugal fan draws the gas current containing the pigment particles from the centrifugal pulverizer, and forces the gaseous dispersion to flow through a cyclone separator which occasions the separation from the dispersion of all oversize particles, for example those exceeding ten microns in effective mean diameter. These oversize particles are collected and returned to the pulverizer.

The gaseous dispersion containing the remaining particles is then caused to flow through a device incorporating means for projecting an atomized spray in the form of an annular or divergent conical curtain of suitable wetting liquid (conveniently white spirit or xylol or other solvents, or a drying oil, or its solution, a varnish, or a polymer, resin, or lacquer solution or mixtures thereof) into the path of the gaseous dispersion, for example coaxially with the gaseous current. The atomized liquid spray or curtain may be produced by any suitable means, for example as described in the pending Application No. 4409 of 1950, whereby the fine particles of pigment suspended in the gaseous current are caused to undergo a violent acceleration as they enter the zone of a high-speed gaseous current containing the wetting liquid as an aerosol or very fine mist, the gas being preferably the same as that used for the dispersion; in this way, the fine pigment particles are caused to collide with the atomised droplets of the spray or curtain, so that the solid particles of pigment become effectively wetted by the liquid droplets, the wetted particles then combining or cohering together to form particles of increased mean diameter.

The wetted particles, now increased in size but still in dispersion, are next caused to flow through a second cyclone separator, wherein the wetted particles which have increased in diameter to a sufficient extent can be separated without difficulty from the gaseous medium in which they have been dispersed. The particles collected in this

second separator are passed to a mixing chamber where they are mixed with a suitable body medium r other vehicle, such as the white spirit or xylol employed for the wetting liquid, a drying oil or its solution, a varnish, lacquer, resin or polymer in solution, or any other solvent or thinner as in the ordinary method of paint manufacture.

After its passage through the second cyclone separator, the gaseous current may be recirculated through the centrifugal pulverizer or other dispersing means for the addition thereto of a fresh quantity of pigment, the current being then forced into the first cyclone for separation of oversize particles as before; in this way, the fine particles which have not been trapped by the second cyclone on the first circuit will have another opportunity of increasing in diameter when wetted by the atomised spray or curtain, so that on the next circuit they may be separated out by the second cyclone and collected for mixing with the body medium or other vehicle.

Recirculation of the gaseous current also results in a saving of both gas and wetting liquid, the latter economy resulting from the fact that in order to prevent evaporation of the fine droplets of liquid it is desirable to operate with gas which is substantially saturated with the liquid.

Where the gas circulates through a closed system, provision will be made for releasing r removing gas from the system when required and for introducing gas into the system when necessary for make-up purposes. The gas employed may consist of air, instead of carbon dioxide or nitrogen as mentioned above, but where there is a possibility of the formation of explosive mixture, for example with white spirit, it is wiser to use an inert gas.

It is to be noted that the invention is not limited to the use of cyclone separators, as other forms of separators may be employed, for example a wet separator may be used for the recovery of the wetted particles or again an electrostatic precipitator may be used.

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1 SHEET

This drawing is a reproduction of the Original on a reduced scale.